Feasibility Study for a Bike Sharing Program in Baltimore County

Baltimore County Pedestrian and Bicycle Advisory Committee

Staff Report
Draft August 22, 2013

INTRODUCTION

On June 3, 2013, the Baltimore County Council passed a resolution (51-13) requesting the Pedestrian and Bicycle Advisory Committee to investigate the feasibility of establishing a bike sharing program in the county. The report is due to the Council by December 31, 2013.

Bike sharing is a program where bicycles are provided to users on a temporary basis to make short trips, generally from ½ to 3 miles. The user picks up a bicycle at one location and returns it to either the same or another location. The purpose is to give individuals access to a bicycle on an as-needed basis, without the expense of buying, storing and maintaining one. Bike sharing is distinguished from bike rentals in that the locations where bicycles are kept are not staffed, and users have the flexibility of returning bikes to different locations.

A Hubway bike share user in Boston.

This report will examine existing bike sharing systems including how they were developed and how they operate. Planning studies related to bike sharing programs are then discussed to provide guidance on how to assess the feasibility of initiating a program in Baltimore County. Next, conditions in Baltimore County are assessed to determine if bike sharing can be supported. Finally, recommendations for future actions are offered.

Existing Bike Sharing Systems

Bike sharing programs originated in Europe, where bicycling is a more commonly used transportation mode, about 30 years ago. In these "first generation" programs, unlocked, brightly painted bicycles were scattered across a city, available to anyone to use for free. Users were able to grab a bike and go, leaving the bike at their destination for another user. This system was plagued by theft and vandalism, prompting the growth of second generation systems. For these, specific locations where established were the bicycles were locked, and a coin deposit was required for access. While no longer free, the anonymity of the system still resulted in problems with bicycle theft and damage. Most of the current systems are third generation, requiring users to be identified through the use of a RFID key and/or a credit card which is charged for the bicycle if it is not returned. The bike stations include automatic docks that lock the bikes in place and an electronic payment kiosk. With continuing advances in technology, a fourth generation is beginning to emerge using on-bike GPS locators and wireless monitoring in lieu of established bike stations.

Capital Bikeshare system in the Washington D.C. region. (bikearlington.com)

The bicycles used in bike sharing systems are basic, sturdy, one size-fits-all, all the same design and color to make them easily identifiable. Some programs are beginning to incorporate e-bikes (bikes with small electric motors to assist in uphill climbs) and adult trikes. A number of vendors in the U.S. such as Alta BikeShare of Portland, Oregon, B-Cycle of Waterloo, Wisconsin, and Bike Nation of Southern California, provide the equipment, including the docking station and payment kiosk as well as the bicycles, and often operate the system.

Bike sharing programs were slow to develop in the U.S. until about four years ago, when interest began to increase dramatically. A federal study identifies two factors that led to the growing level of interest: the rising popularity of bicycling as an urban transportation mode, and the technological innovations of third and fourth generation systems that have almost eliminated the problem of theft and vandalism.[1]

Nearly all of the existing and planned systems in the U.S. serve either large cities or universities. According to bicyclinginfo.com, there are currently 49 existing or planned bike sharing programs that are based in U.S. municipalities and 29 programs based at university or college campuses.[2]

Existing systems are typically arranged into a contiguous network of stations with short distances between the stations. Most systems are rolled out gradually, establishing a few bike stations at core locations, and gradually adding on to create a wide-ranging network as the system's ridership and the availability of funding grows.

The smallest programs have one or two bike stations with 12-15 bikes. Universities frequently have only one or two bike stations, but a larger number of bikes, ranging between 20 and 50. Examples of smaller systems include Spartanburg, South Carolina with two stations and fourteen bikes and Boulder, Colorado with 18 stations and 150 bikes.

The largest systems are those of major cities such as Boston, Chicago, and Los Angeles, Washington D.C., and New York. Boston's system has grown to 100 stations and 1000 bikes. Launched last spring, Chicago's Divvy Bikes is expected to grow to 400 stations and 4,000 bikes, as is Los Angeles' system, which should be launching soon. New York's system is the largest system in the U.S. It launched in May 2013 with 330 stations and 6,000 bikes, and is planned to grow to over 600 stations and 10,000 bikes. Ridership of New York's system reached 40,000 trips a day in just two months of operation.

New York's citibike, named for Citi Bank, the system's corporate sponsor *(www.wnyc.org)*

Chicago's Divvy, whose slogan is "Divide and Share" *(www.chicagomag.com)*

Washington D.C.'s Capital Bikeshare program is the nearest operating system to Baltimore County. Opening in 2008 as ShareBike, it was the first third generation system in the U.S., and became the largest until New York's system opened. When the system was re-implemented in 2010, its popularity grew quickly, especially with tourists. It now includes over 200 bike stations located throughout Washington, Arlington and Alexandria with an annual ridership of more than 2 million. Montgomery County was added to the Capital Bikeshare program in 2012, adding 50 new sites.

Baltimore City is planning a system expected to launch in the spring of 2014. The Charm City Bikeshare program proposes 25 stations and 250 bikes in its initial phase, to be located in downtown, midtown and Southeast Baltimore. The city received a state Cycle Maryland grant that will pay 80 percent of the $1.1 million start-up costs, which will include purchasing cycles and station equipment. The system will be owned by the City of Baltimore and operated by a selected vendor. Baltimore began an aggressive bicycle infrastructure building program in 2006, creating over 100 miles of bike lanes and 39 miles of bike trails. Its first attempt at implementing a bike sharing program failed when the selected vender did not install it within the designated time period.

Howard County is in the process of hiring a consultant to conduct a feasibility study for its bike sharing program. The consultant will examine four locations in the county—two areas in Columbia, Maple Lawn and the Route 1 corridor in Elkridge and Jessup. Citizen input will be a

large part of the planning process to determine their interest and ideas in locating bike sharing facilities in Howard County.

On average, implementing a bike sharing program costs $4200-5400 per bicycle in capital expenses and $150-200 a month in operating expenses.[3] All bike sharing systems are funded through government and/or nonprofit programs, with or without a commercial partner, such as an advertiser or bicycle manufacturer. Health organizations are a common nonprofit partner. No program is currently self-sustaining economically. The benefits of the program come from reduced traffic congestion, air pollution and health costs and, for some locations, an increase the area's vitality and attractiveness to new, younger residents.

Existing Planning Studies

Planning for bike sharing in the U.S. varies, with some jurisdictions conducting detailed feasibility studies prior to undertaking the program, and others proceeding straight to implementation. Even in the more cautious approach of first conducting a feasibility study, there appears to be an assumption that a bike sharing program is appropriate for the jurisdiction. Existing feasibility studies focus primarily on bike station placement and development of an operating or business plan. Planners look to the characteristics of jurisdictions that have successful bike sharing programs for guidance in establishing the criteria used to determine bike station placement. Since most bike sharing systems have been located in large urban centers and college campuses, these are the models most jurisdictions use, looking to bike sharing programs of similarly-sized jurisdictions to design of the system. While there is a growing trend for smaller urban centers to embark on bike sharing programs, programs in suburban areas have not yet been attempted.

A 2012 USDOT Federal Highway Administration Study, *Bike Sharing in the United States: State of the Practice and Guide to Implementation,* compared12 bike sharing programs in the U.S. of varying size. Based on this review, the report suggests that the following elements are needed to support a bike sharing program.

- Density, including both a large number of residences and jobs
- Diversity of land uses including retail/commercial activity, proximity to colleges and universities, and recreation or tourism sites
- Strong public transit system
- High levels of pedestrian activity
- Relatively flat terrain, with most slopes less than 4%
- Relatively temperate climate for year-round operation (jurisdictions can provide seasonal programs when the weather is conducive to cycling)
- Available bike infrastructure, or at least evidence of bike ridership and visible signs that bicycling is encouraged
- Political, financial and public support

These factors are very frequently addressed in the variety of feasibility studies examined for this report.

Alta Planning + Design (ADP), a sister company to Alta Bikeshare, which operates several bike sharing programs, is a leading consultant used to perform feasibility studies. It has completed studies for Marin County and Mateo in California, Cincinnati, Ohio, Providence, Rhode Island and Memphis, Tennessee, among others.

ADP describes the types of users and trips that make bike sharing successful as those that can occur continually throughout the day including:

- Residents living in mixed use environments to access work, shopping or recreation
- Users of public transit, accommodating "the last mile" of their commute to work or to access shopping, entertainment and cultural attractions
- Tourists who do not have access to a car or prefer the opportunity to experience a new place by walking or bicycling
- Students at college campuses to access different locations on campus or nearby commercial areas without the need to rely on a car or wait for a shuttle bus

ADP's planning approach includes an examination of population characteristics, first looking at the size of the population to be served. Even though most current systems serve large

populations, ADP notes that systems can be scaled down for smaller jurisdictions. Population density is cited as being the most important criteria, particularly in association with mixed use; that is, having a large number of people able to use the system to access a variety of land uses within a bikeable geographic area, generally considered as being a 3-mile radius. However, population density can also vary widely among systems, especially as smaller jurisdictions are now beginning programs. For example, there are 1,200 persons per square mile in Chattanooga, Tennessee, compared to 10,000 persons per square mile in Washington D.C.

According to ADP, user surveys have shown that people aged 25 – 34 years old are those most likely to use the system. This age group represents between 39 and 49 percent of people using bike sharing systems but represents only 18 to 22 percent of the general population. APD describes these as the "early adopters," those who are quick to use bike sharing and lead the way for people in other age groups to consider trying it out as the number of visible users grows. College students are also likely to be early adopters of bike sharing, says ADP, noting the number of existing bike stations on college campuses.

In locating trip generators and attractors for users of a bike sharing system, ADP and other feasibility studies identify heavily used transit stops or transportation hubs, major employers, business and college campuses and recreational and cultural locations with high visitor activity.

Studies also examine the existing bike culture and infrastructure. For ADP, the presence of bicycle infrastructure does not seem to be a critical component, as long as the road network can serve users comfortably. In its Cincinnati study, ADP noted that the city's well-connected streets, relatively slow speeds, and generally flat topography provided a reasonably comfortable cycling environment without the presence of bicycle infrastructure.[4] Another feasibility study for by Fehr & Peers, et al, for Monterey County, California, incorporated an analysis of road intersection density, citing transportation studies that show a strong correlation between the densely interconnected street networks, such as one would find in an urban grid system, with bicycle ridership, seemingly supporting the notion that the presence of bike infrastructure is not necessary if a interconnected street network is present.[5]

However, a Georgia Institute of Technology study of the Capital Bikeshare system in Washington D.C. found a significant correlation between the presence of bicycle lanes and

Capital Bikeshare usage, suggesting operating agencies will get a higher ridership if additional stations are located in areas with a higher density of bike lanes as well as population and retail destinations.[6]

While the presence of existing bicycle infrastructure on the success of the bike sharing system can be debated, all sources see the presence of a bike culture as being a critical component. If bicycle infrastructure does not exist, then there needs to be visible bicycle use or at the very least, strong public, political and financial support to endorse and encourage the use of bicycles as transportation.

Bicycling for Transportation in Baltimore County

The Baltimore County Council adopted the first phase of a pedestrian and bicycle plan for the eastern urban county in 2006, and the second phase for the western urban county in 2012. The plan provides recommendations for the development of a comprehensive network of bicycle facilities to connect the county's residential areas with key employment, commercial, educational and recreational destinations. The recommendations include both on-road bike routes, bike lanes and sharrows and off-road sidepaths along roadways and greenway paths along stream valleys.

The plan addresses each of the five "E"s of active transportation planning, including not only Engineering—the building of bicycle infrastructure—but also Education, Encouragement, Enforcement and Evaluation. All of these elements are needed—infrastructure and the supportive programs—to create a bicycle transportation system.

The plan notes that because most of the "urban" county is built out in a "suburban," auto-oriented pattern, retrofitting for bicycling will be a challenge, both physically and financially. This suburban pattern is not as conducive to bicycling as is the urban pattern characterizing major cities like Baltimore City and many smaller, traditional towns that were built with a gridded road structure. Gridded systems provide multiple, closely spaced alternative routes that disperse traffic, as opposed to a suburban hierarchical layout. In a hierarchical system, smaller residential streets feed into larger collector streets, and the collectors feed into even larger

arterials. Streets are purposefully laid out in residential neighborhoods so they don't interconnect to keep the amount of traffic to a minimum, but this negatively impacts the ability of residents to reach destinations by walking or biking. Pedestrians and bicyclists generally need to use a heavily traveled, higher speed collector or arterial road to access destinations that are not in their immediate neighborhood or find a circuitous alternative route.

Suburban development also employs low density, "Euclidean" zoning, where land uses types are separated from each other. Generally, residents must travel long distances to reach destinations, making access by walking or biking more difficult and lengthening the time spent on collector and arterial roads.

During the development of the County's pedestrian and bicycle plan, citizens completed surveys to gauge their opinions about walking and biking. Citizens noted a variety of factors that discouraged them from bicycling, most frequently citing the lack of safe places to bike. Many said they would not feel comfortable riding on county roads without bike lanes, and would prefer off-road paths.

County staff used a statistical model, Bicycle Level of Comfort (BLOC), to rate selected roads in their existing condition for bicycle use, and then in an improved condition, such as with the addition of a bike lane. The model rated each road on an A to F scale, with A exhibiting the most comfortable condition, such as a wide width, low traffic volume, and low speed limit. A rating of F is the most uncomfortable, characterized by high speed, high traffic volume, and a high level of truck traffic. The ratings of most roads in Baltimore County were in the range of C to F, but could be improved to an average of B or C with the addition of a bike lane.

At the time of the planning process, only a limited number of bicycle facilities were present. The Maryland State Highway Administration had begun to sign and stripe a few of the state roads for bicycle use. A few shared use paths were developed largely in county and state parks for recreational use. A nonprofit group in Catonsville, Catonsville Rails to Trails, spearheaded the development of several trail projects in Catonsville including the No. 9 Trolley Trail, the No. 8 Streetcar Path, and its current project, the Short Line Rail Trail. The county Department of Public Works had also signed and striped a few of the county roads for bicycle use in response to community requests.

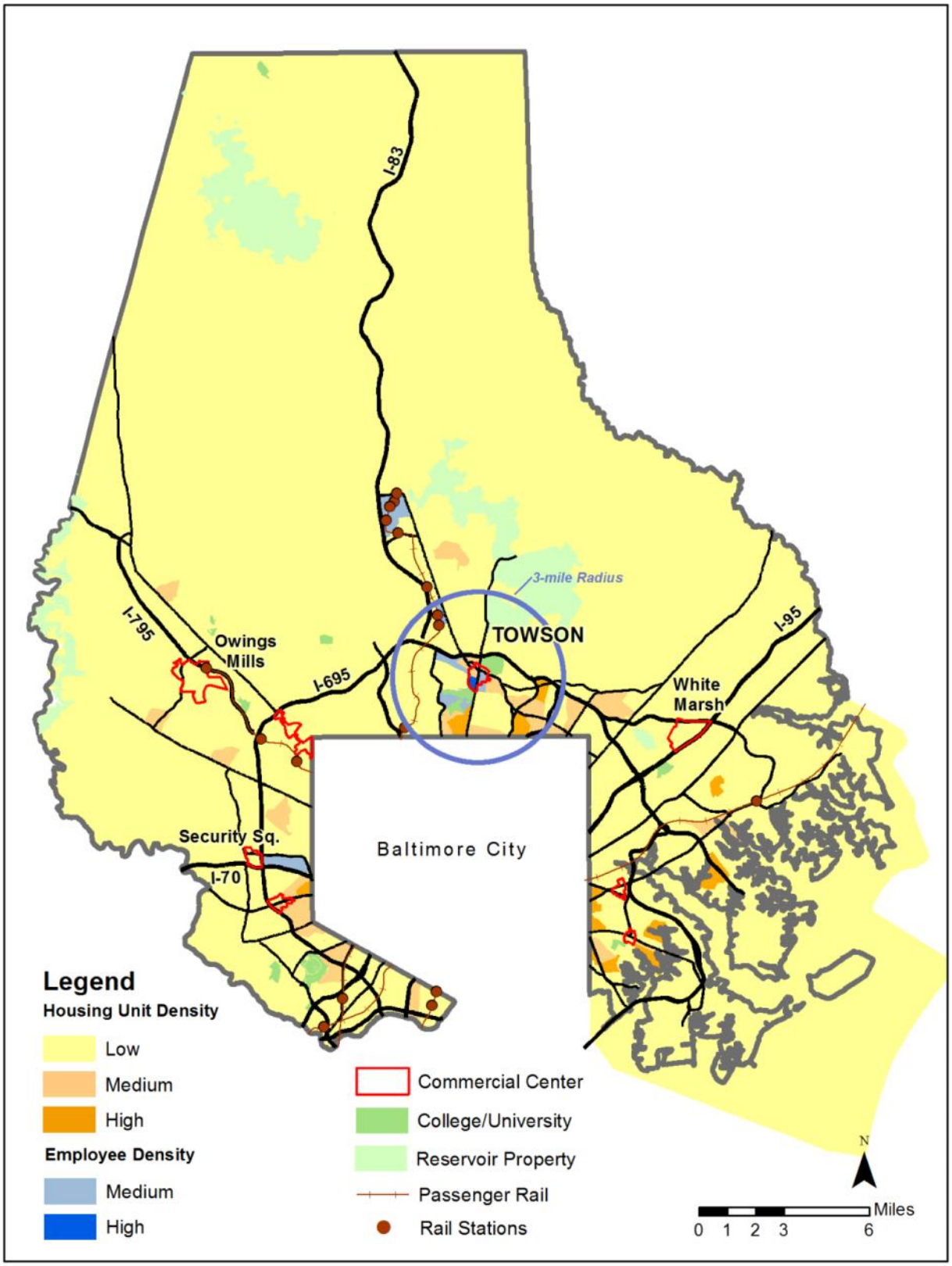
Since the county's bicycle facilities plan was adopted, only a few improvements have been undertaken primarily due to economic conditions that caused the county to cut back significantly on capital projects. Initial construction drawings were prepared for a shared use path along Perry Hall Boulevard (part of the Northeast Trail). Developers have been able to construct a portion of the path as part of their development projects. Recently, the county has been able to secure state funding to make on-road improvements for a bike route linking UMBC to the Arbutus Business District and the MARC train station, bike lanes on Edmonson Avenue in Catonsville and a bikeway encircling Towson, as well as another short segment of the Northeast Trail at Indian Rock Park. These projects are in the process of being implemented.

The Feasibility of Bike Sharing in Baltimore County

Based on the existing status of bicycling in Baltimore County, it is unlikely that a bike sharing program would be successful. Few of the county's existing roads provide conditions that would be comfortable for anyone but the most intrepid and advanced rider. As indicated by citizen surveys, bicycle infrastructure in the form of bike paths and bike lanes are needed to make bicycling acceptable to the general rider as a safe travel mode. Baltimore County is just beginning to build a bicycle network, and it does not yet have any bicycle facility that links major destinations. While there does appear to be latent demand for bicycling, indicated by the large number of citizens who attended the workshops and completed the online questionnaire, the actual creation of a bike culture pivots on the provision of infrastructure. Too many people view the existing conditions as barriers to bicycling.

Would a bike sharing program work in Baltimore County when there is enough infrastructure in place? To date, only two types of environments have been demonstrated to support bike sharing: high density mixed use communities and college/university campuses.

The map below displays the residential and employment density of census tracts in the county, along with the boundaries of its largest commercial areas (town centers). Only in Towson do all three types of land uses with moderate to high density coincide.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I-95
White Marsh
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Security Sq.
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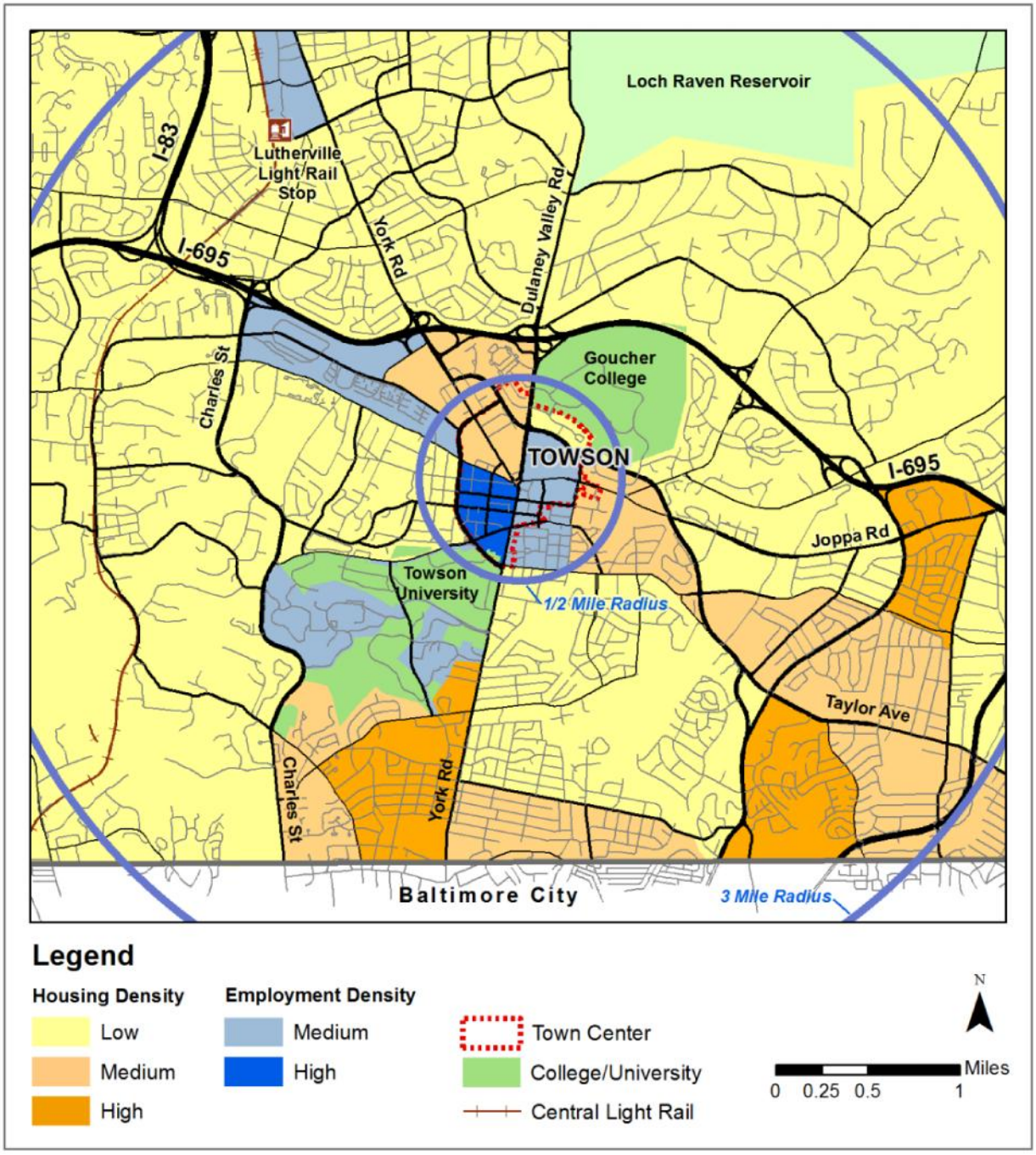
Towson has a small, gridded urban core. The residential density of Towson's core is not significantly high, but that is likely to increase substantially as a number of proposed mixed use projects are developed over the next few years. As the county's government center, the employment density is the highest of any census tract in Baltimore County. Most important to making a small bike sharing system viable, however, are the two adjoining college/university



campuses. These campuses represent important attractors/destinations, as well as providing a population of "early adopters."

Towson is not served by rail transit and bus users are more likely to complete their transit trips by walking. The Lutherville Light Rail Stop is located within Towson's 3-mile radius, and so could possibly become part of Towson's bike sharing system.

Two other factors could impact the success of a Towson bike sharing program. One is topography. The land around Towson is moderately hilly, and there are a few locations where bike facilities on roads will exceed 4%. This could make a short bike trip challenging for some riders.

The other factor is climate. Baltimore County's weather can be very hot and humid in the summer, and cold, snowy and icy in the winter. While not extreme enough to warrant a seasonal operation, the weather will probably discourage use at times.

Recommendation

Baltimore County should continue to put efforts into building its bicycle network infrastructure, continuing its current emphasis on locations with a high potential for use, including the Towson area. The county can begin to build partnerships with its colleges and universities as well as other entities such as the local business groups. These organizations could potentially share both in providing bike facilities on their properties, and in participating in encouragement, enforcement and education programs such as organized bike rides, bike to work day events, bike safety instruction, and promotional brochure preparation and distribution. The most important criteria for a bike sharing system—a bike culture—should be firmly established before contemplating a bike sharing program.

Once bicycle infrastructure connects important destinations and there are visible signs of growing bicycle use, funds for planning and implementing a bicycle share program can be sought through the state Cycle Maryland Program or the federal Transportation Alternatives Program. The planning process should include extensive input from potential users of the

system to determine bike station locations and estimate potential ridership. From there, the system can be designed, cost estimates prepared, and funding and operating partnerships formed, culminating in the implementation of the system.

While a bike sharing program has the ability to amplify the many benefits that bicycle transportation can bring to a jurisdiction—reduced traffic congestion, improved health, and economic growth through the creation of more livable, sustainable communities—Baltimore County, as a suburban locality, will need to create the bike network and build the bike culture first.

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